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Washington Focuses on Industrial R&D Lag

First comes political interest and then comes rapid budgetary growth. That's been the pattern of postwar federal support for various major sectors of research and development, as evidenced by the sequential funding history of R&D for defense, health, space, oceans, cancer, environment, and energy.

What's next?

From rumblings around Washington, and reverberations in the White House Office of Science and Technology Policy (OSTP), SGR would place its bets on a complex, long-debated, but little-touched subject of federal concern: industrial innovation, i.e., the long process involved in making the transition from ideas to market-winning products.

The federal interest in industrial innovation, and particularly its R&D component, is not new, but in terms of expenditures it is small. Veterans of the Washington scene will recall that the Kennedy Administration unsuccessfully tried to promote a Civilian Technology Program, aimed at infusing the spirit of high technology into lagging industries; that the sales campaign for the space program included rich fantasies about "spinoffs" to the civilian economy; and that Richard Nixon for a time toyed with what was labeled the Technological Opportunities Program, including awards — which were never bestowed — of up to $50,000 for the inventors of hot marketplace items.

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What's behind today's interest in innovation is simply that things have got a lot worse for US aspirants in world marketplaces. And with high-cost oil imports creating an economic drag and an increasing US trade deficit, interest is once again focusing on how the federal government might employ its resources, authority, and purse to boost the performance of some of our slumping industries.

The Carter Administration has so far taken only limited steps toward this goal. The Commerce Department, for example, is tinkering with a Cooperative Technology Program, which, under the auspices of the National Bureau of Standards, is aimed at assisting in the development of "infratechnologies" for various industrial sectors. Aid for the shoe industry is high on the list of priorities. NBS has been budgeted $2 million for the first year of the program, and will also be able to make use of perhaps as much as $10 million from a government fund that's intended to assist industries hard hit by foreign competition.

Meanwhile, the National Science Foundation has invited academic and industrial groups to collaborate on research projects. And, though NSF couldn't persuade the Office of Management and Budget to permit it to set aside funds for such joint efforts, the Foundation has announced that "Jointly prepared proposals from cooperating [academic and industrial] institutions will compete for funds with regular proposals. . ." Last year, NSF inaugurated a Small Business Innovation Program; so far, it's awarded 42 contracts of about $25,000 each to support initial studies of concepts which, if deemed promising, will be eligible for further assistance.

In addition, various efforts related to the problems of industrial innovation can be found in one or another nook and cranny of the federal establishment. Commerce, for example, in collaboration with the Securities and Exchange Commission, is conducting a study of

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In Brief

In what is taken to be a shrewdly designed tactical ploy, HEW Secretary Califano has revealed that one scheme under study calls for the proposed Department of Education to absorb the entire National Science Foundation. That revelation, along with plans to take over all education programs of the Veterans Administration, is sure to arouse enough opposition to keep education in HEW, where the cagey Califano wants it to stay.

The AAAS has joined the ranks of organizations that will meet only in states that have ratified the Equal Rights Amendment. As a result, AAAS has cancelled plans to hold next year's annual meeting in Chicago and will instead meet in Houston.

General George S. Brown, chairman of the Joint Chiefs of Staff, is worried about all those Russians running loose in the US, including those involved in scientific exchange programs. He recently told a Congressional hearing that "Their itineraries were not closely monitored, so the amount and nature of the information they obtained is not fully known."

. . . Carter Seeks New "Surge of Innovation"

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factors affecting the availability of venture capital for small R&D firms.

All this, however, is small stuff when viewed against the Carter Administration's lamentations about US industrial performance and its accompanying assertions about the need to spur that performance by various means — high among them, R&D.

Starting at the top, let's look at Jimmy Carter's recent State of the Union message. The long, written version, as distinguished from the shorter State of the Union address to Congress, contained a passage that has so far drawn little notice. After paying customary court to the value of science and technology for "economic well-being" and other purposes Carter stated:

"I am recommending a program of real growth of scientific research and other steps that will strengthen the Nation's research centers *and encourage a new surge of technological innovation by American industry"* (SGR's italics).

Now, this presidential assertion may summon up recollections of Britain's Harold Wilson in 1964 forecasting a new — but unattained — prosperity "forged in the white heat of a technological revolution." But whatever the future may hold for the Carter initiative, there should be no doubt that it is underpinned by careful analysis of, and serious concerns about, US economic malaise and the international dynamics of industrial productivity. Stated briefly, while Japan and West Germany sock the US at one end of the spectrum, the poor countries are getting technologically smarter at a pace faster than was anticipated, and, with their lower labor costs, are cutting into markets once dominated by all the so-called advanced countries.

The issues involved were extensively discussed February 13 in Washington by White House Science Adviser Frank Press in an address — "Science and Technology: The Road Ahead" — at the annual meeting of the American Association for the Advancement of Science.

Referring to the industrialized nations' chronic unemployment, inflation, and declining productivity, Press observed that while productivity "is slipping in the advanced countries, it is rising in the developing nations. The reasons for this," he continued, "have a profound implication for science and technology — particularly industrial R&D.

"They have to do with the fact that many of our intermediate, and even some of our high, technologies are being successfully adopted by the developing countries, who, on some items can now successfully compete with us. . .In such areas as steel, textiles, and light manufacturing, productivitiy rates have actually declined in the advanced nations since 1973. At the same time, however, the developing nations have been increasing their share of trade, based on industrial items such as textiles and light manufactured goods — and this includes some higher technology goods such as electronic items. This kind of production in the developing countries grew at a rate of 8.5 per cent last year, while, in the advanced nations, it barely rose to its 1974 level (4.7 per cent). . . .

"To some extent," Press said, "we can applaud the fact that there are developing countries successfully adopting manufacturing that will raise their productivity and living standard. The whole point of development is 'to make the poor productive.' However, as this transfer of technology and industrial capacity takes place at one level, it is essential that the advanced countries continue to advance in their innovation and productivity. Otherwise, the major markets will begin to collapse around the world, we will be resorting to protectionism instead of industrial creativity to save our domestic economies, and eventually global chaos will ensue. . . .

"The harsh truth is that we are now very much

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. . . Science Adviser Outlines R&D Studies

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locked into a dynamic system of global economic growth, and it is one based on technological change and innovation. . .There are enormous pressures ahead for us to innovate and improve productivity."

Referring to "conservative growth calculations" of a three to four billion increase in the worldwide labor force by 2050, Press said, "The crucial point is the need for innovation. And a principal basis of innovation today is research and development. This is one reason why we are concerned with the state of industrial R&D in this country and why the Administration will be focusing much attention on it in the coming year."

As for specifics, Press offered only a basic outline of studies that are to be conducted by the Commerce Department, but given the scale of the problems he recited and the President's State of the Union remarks, the few available details merit notice.

Press said, "We will examine such things as the impact of Federal regulations on industry, the availability of investment capital, the assertions that industry is becoming increasingly 'defensive' in its R&D, that it is turning from longer-term research and bolder innovation to emphasis on short-term needs and product improvement.

"We will be considering ways to change this situation — possibly to reduce certain regulatory burdens on industry (without compromising public needs), to introduce incentives to more exploratory and long-range research, to increase the development and implementation of innovation, and to encourage the investment of capital in new facilities that will improve industrial productivity."

That's about all Press had to say on the subject, thus leaving the question of what happens now?

The answer appears to be that the study process will be intensified, along the lines described by the Science Adviser, while the Commerce Department gains experience with the new Cooperative Technology Program. While other nations, particularly Japan and West Germany, are relatively unhindered by institutional difficulties when it comes to linking government R&D expenditure to civilian industry, the US experience in that area is fairly slim. R&D aid for any one particular firm invariably touches off politically volatile charges of favoritism, while industry-wide collaboration in R&D, even when subsidized by the federal government, can easily run afoul of anti-trust regulations.

It was these problems that helped scuttle the Kennedy Administration's efforts to come to the aid of industry, though that sad chapter also included a lot of irrational Congressional hostility fed by fears that the real aim was to promote automation and put constituents out of work.

What's lacking in the American scheme of things is a conceptual and ideological framework for government assistance for R&D that's aimed at products for the general marketplace. The government, of course, is deeply involved with financing R&D in industrial firms. But with few exceptions, the government itself is the ultimate customer, as is the case with defense and space research, which, together, help account for well over half of federal R&D spending. The technological environment is enlivened by these expenditures, and they do ultimately have some effect on products aimed at the civilian market.

Nevertheless, in contrast to the way things work in Japan and West Germany, whose governments invest heavily in R&D for civilian industry, US activity in this mode is relatively slight. Nuclear power is an exception, but its close linkage to military origins and uses easily accounts for its special status. Similarly, aeronautical research gets a lot of government funding that ultimately benefits the aviation industry, but here, too, the longstanding military link provides a tradition that overcomes political squeamishness about government-supported R&D aiding what is technically private industry.

The most talked-of approach to the problem involves the "infratechnology" concept, which calls for government to pinpoint its R&D aid on the development of technologies that can be economically exploited by any and all comers. Thus, in the ailing shoe industry, the idea is that research on automated production techniques will show how it can be done, and then individual firms can go ahead and do it.

The concept has the political advantage of being up for grabs, rather than tailored for any particular firm. Also, as local industries encounter increasingly strong foreign competition, such assistance is not likely to encounter Congressional opposition.

At this point, the Administration is feeling its way on the problems of how to aid industrial innovation. But as noted above, there's a lot of pressure to do something about holding on to this nation's lead in research and development for industrial applications. And over the next few years, this pressure is going to be felt throughout the national R&D enterprise — in the laboratories of government, industry, and academe. —DSG

A Boost for Social Science in New Budget

Behavioral and social science research, rarely a big growth item in any year, is slated for healthy increases as part of the Carter Administration's emphasis on basic research in next year's budget.

The most striking increases would be for mental health research, an almost obligatory gesture on the part of an Administration which has conspicuously made that area a subject of personal interest. However, at the same time, smaller, but no less impressive, gains would be made in social science research at such unlikely places as the Department of Agriculture — in all cases, Congress willing, of course.

Early in the budgetmaking process, a major boost appeared certain for the Alcohol, Drug Abuse, and Mental Health Administration (ADAMHA). The Mental Health Commission, with Mrs. Carter as its honorary and very active chairman, had made an appeal for more money for mental health research in one of its few unqualified interim recommendations last fall. However, HEW Secretary Califano wasn't too keen for a major increase, nor was the Office of Management and Budget. What finally produced a generous outcome — $40 million in new research money added to the existing budget of $160 million for ADAMHA's three sister institutes — was a direct, last-minute intervention by the White House.

The lion's share of the research increase would go to the currently headless National Institute of Mental Health, whose recently fired chief, Bertram Brown, had invoked the Carter concern for mental health in an effort to upset Califano's decision. The near-$22 million increase for mental health research would bring the total for that activity to well over $100 million and would mean the first real growth in years in both outside and intramural research programs. At the same time, the White House overrode another Califano decision — to put the training of psychiatrists, clinical psychologists and other mental health service providers back on a phaseout course — again deferring to the Mental Health Commission's wishes. But while the requested research increase can be seen as in keeping with both the special White House interest in mental health and its general desire to expand the federal government's support of basic research, the training move can be viewed only as putting the program on hold.

The President's mental health panel asked only that the White House stay any definite action on training until it had more time to study the matter. In addition, sources indicate that the fate of special training subsidies — in mental health or any other area — lies in the shifting sentiment of policymakers away from the notion that government ought to underwrite the costs of professional education, except in cases of real national need.

At the National Institute of Education, HEW's research arm for education, the behavioral and social sciences would likely benefit from a double-barreled emphasis on basic research. Not only would NIE receive a $10 million increase for research (bringing NIE's total to $100 million), but its policy board, the National Council on Educational Research, instructed NIE last summer to earmark at least 20 per cent of its next budget for fundamental research. The largest increase at NIE would be in research on basic skills, with some $5.4 million going to launch a major investigation of student achievement and testing, research on test score trends and basic research on standardized tests.

At the National Science Foundation, too, the behavioral and social sciences would be in for considerable increases. In fact, the percentage increases of 17 per cent for the behavioral and neural sciences division, plus what NSF Director Richard Atkinson called a "whopping" 22 per cent increase for the social sciences division, would outstrip the percentage increases for most basic research activities at the Foundation. The only hitch, program staff are quick to point out, is that the dollar base for behavioral and social science activities is so low compared to NSF support for other scientific disciplines, it's hard to get too excited.

For example, the behavioral and neural sciences division would increase from a current $23.3 million to $33 million next year; the social sciences from $24 million this year to $29.4. By contrast and within the same directorate, the physiology, cellular and molecular biology division would increase from $57.3 million to $61.3 million, only a 7 percent increase; environmental

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How to Query Energy Dept.

Here are some new telephone numbers for getting information out of the sprawling Department of Energy, which has now consolidated its Central Press Services in offices at 12th St. and Pennsylvania Ave., N.W., Washington. All on area code 202, the numbers are: general information — 566-9833; conservation and solar — 376-4064; energy technology — 376-9471. Nuclear and national security information still resides in Germantown, Md., at 353-3337. Though these numbers are intended for press inquiries, they also provcide a good starting point for ordinary puzzled citizens seeking their way through the DOE maze.

. . . But Proposals Still Far Exceed NSF Funds

biology programs would increase from $32.6 million to $34.2 million.

The point that's too often lost in discussion of the budget, according to behavioral science staff members at NSF, is that the 19 per cent success rate for the growing number of high-quality proposals in the behavioral and neural sciences is probably the lowest of any program in the Foundation. Therefore, in terms of meeting the demand, they say, the increases would help, but wouldn't enable the program to keep pace with mounting pressures for funding. According to one staffer, "We're so late and so far behind that it takes a long time just to catch up."

Limited as they may be, the requested increases for basic social and behavioral research at NSF may be due in part to some lobbying on the part of the National Science Board. The Board has suggested more than once in recent years that the Foundation put more money into those disciplines. At the same time, the Board has sent letters to mission agencies, urging stepped up spending in the social sciences.

As usual, the budget would give the Defense Department the largest bite of the basic research increase — 14 per cent. Although most of the money would go to research on weapons and lasers, not all of DoD's problems are in hardware. One of the biggest and most publicized problems the services are facing under the all-volunteer arrangement is attrition; volunteers are skipping out before their first hitch is up. Some of the increases — in the vicinity of 10 per cent — for behavioral and social research would relate indirectly to research issues in motivation, training, and career satisfaction posed by the attrition problem.

Even at the Department of Agriculture, not considered to be one of the major sources of research support in the behavioral and social sciences, the Carter budget would provide increases. The Department would devote about $11 million next year to research in human nutrition, and part of the increase would support work on such subjects as behavioral factors affecting food preferences and what role social and institutional influences play in what we eat.

It wasn't so long ago that DoD funding of classified behavioral and social science research caused such a ruckus in Congress that there were serious questions about whether any human sciences research would survive in that agency. It was also not so long ago that NSF had to be reminded that behavioral social science research was within its mandate — only to be further reminded by Sen. William Proxmire (D-Wis.) that every mandate has its limits. And, it's a recent fact that when science in general hasn't fared too well, the behavioral and social sciences have done even worse. So, given the recent past for social and behavioral science funding, the Carter budget may hold out something less than a gold mine, but it's an improvement over the past. — PM

News Notes: NBS Chief, Cornell Gift, Nuclear Effects

Ernest Ambler has finally been installed as director of the National Bureau of Standards, after serving as acting director since July 1975. Senate confirmation — long delayed by reviews and re-reviews of his nomination, which dated back to President Ford — came February 3. There was never any opposition to or even doubt about the widely approved appointment. Rather, it was just one of those things that take a long time to get through a big government.

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Cornell University's Department of Geological Sciences is the recipient of an anonymous bequest that's estimated to be at least $5 million. The exact sum won't be known until the estate is settled. An announcement from Cornell quotes Jack E. Oliver, chairman of the department, as saying that "the gift provides us with the opportunity and responsibility for bringing to Cornell the finest department of earth sciences in history."

A third edition of "The Effects of Nuclear Weapons," a standard and widely cited work on the damage-producing powers of nuclear explosives, has been published by the Department of Defense. Copies are available for $5.50 each from the US Government Printing Office, Washington, DC 20402. Order by Stock No. 060-000-0003-4.

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Correction

SGR got things a bit mixed up last issue when it reported that a policy paper, "The Responsibilities of NIH at the Research/Health Care Interface," was soon to be issued by the office of the director of the National Institutes of Health. It was actually issued in February of last year. What's still pending is formal approval by the Secretary of Health, Education, and Welfare. Meanwhile, NIH is going ahead with the policy plans outlined in the paper.

OTA Head Spouts 100-Proof Environmentalism

If the US Congress thought it was hiring a neutral, civil servant type when Russell Peterson was appointed director of the Office of Technology Assessment (OTA), the notion was publicly interred February 16 in a rip-snorting, vintage environmentalist speech that Peterson delivered in Washington at the annual meeting of the American Association for the Advancement of Science. Formerly chairman of the Council on Environmental Quality, Peterson was known for his outspoken positions on an assortment of public issues. But it was assumed — obviously erroneously — that as chief of OTA, he would recede into the quiet anonymity that is usually expected of Congress' hired hands. That he hasn't is evident from his AAAS speech, "Science and the Quality of Life," his first major public statement in Washington since becoming OTA director. Excerpts follow:

Nothing has had more of an impact on the quality of life than the application of science — both positively and negatively, and so it is likely to be in the decades to come. The challenge is to apply our scientific knowledge in ways that will maximize the positive impact and minimize the negative. . .

Our inability to deal adequately with energy results in part from the assumption that the solution to the problem will have to be compatible with the enormous centralized generating facilities which are providing an increasing share of our electric power. Once this assumption was made it was largely self perpetuating. The enormous federal investments in developing, commercializing, fueling, insuring, protecting and providing waste disposal for nuclear facilities have greatly accelerated the development of this technology with respect to possible competitors. The clear and continuing federal commitment to the development of new centralized facilities has given the centralized technologies prestige which discouraged private investment in alternatives. Subsidies for this approach have had the effect of creating a large constituency of scientists, engineers, and investors which has developed its own political momentum.

One of the casualties of the assumption that energy will always be best provided by centralized facilities is an inability to think clearly about the advantages of solar energy and energy conservation technologies. Both of these technologies work best when they are matched to the immediate requirements of the buildings or industrial facilities served.

They lend themselves to rapid construction in sharp contrast to the long lead times required for centralized facilities. The implementation of these technologies will not require any profound reshaping of industrial, financial, or governmental institutions since they can be built, financed, insured and maintained by the kinds of organizations now providing similar services for heating and air conditioning equipment. The technology is of a scale that permits concepts to be developed and brought to the market by many different kinds of organizations. Competition in these technologies is feverish and probably always will be. Supporting the decentralized technologies, however, will not be easy and will require an unprecedented amount of imagination, flexibility and restraint on the part of policy makers. But what would happen if the federal government were to make a commitment to the development of small renewable energy sources equivalent to the commitment we made to develop fission reactors two decades ago?

The advantages of the enormous energy resource which these solar and conservation technologies represent can only be properly understood if social and environmental issues are considered along with the technical ones. It will, however, probably be easier to resolve the technical questions associated with the development of new energy technologies than it will be to understand the ways in which they can be integrated into a society we would like to perpetuate. This difficulty must not deter us since unless we are careful we may find ourselves in a position where we must adjust our society and institutions to fit the technologies which we develop instead of the other way around.

Scientists, engineers, innovators face a challenge of their own in resisting the momentum of the status quo. Their views are of limited value unless they are brought

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Whalen Succeeds Peterson

Rep. Charles W. Whalen Jr., a six-term Republican from Ohio, is to be the head of New Directions, succeeding Russell Peterson, who recently became director of the Office of Technology Assessment.

New Directions, founded 16 months ago as an internationally oriented version of Common Cause, said that Whalen will start parttime in July and will take over fulltime in January. Whalen, who is not running for re-election, is a member of the House Committee on International Relations and is the ranking Republican on the subcommittees on Africa and International Economic Policy and Trade.

. . . Peterson: Scientists Should Speak Out

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to the attention of the top decision-makers. This is a critical organizational problem. Nearly all decision-makers are oriented toward the near term. They are besieged by a multitude of urgent problems. Tomorrow's problems can wait. But the scientists' business is with tomorrow. And it's increasingly urgent that they get to see the boss today. With today's trends in the world leading to catastrophe, the decision-makers better get close to the practitioners of change.

At the same time it would do well for scientists to establish the habit of stepping back occasionally from the immediate task to reflect on what kind of a world he or she wants for his or her children and grandchildren and consider whether the work he is doing is leading in the right direction. If not, the scientist should have the courage to alter his course, even if it means some near-term personal sacrifice. It requires courage to speak and act effectively against the status quo. But educators and scientists can bring about the essential changes. We should pursue responsible, professional goals, but at the same time we need to work toward worldwide goals. We need to become comprehensivists. Traditionally, scientists have broken their endeavors down into specific disciplines for their own convenience, and hence have perceived reality from many different perspectives. Such specialization has been necessary for scientific and technological advance; and we have learned much more and learned it quickly by breaking phenomena down into various compartments and studying them from the standpoints of biology, physics, chemistry and so forth. But we must remember that our world does not exist in compartments; it comes in single, interrelated communities, each part of which affects other parts. It does no good, for example, to consider only the effects of oil-shale development when at the same time, in the same region, strip mining and coal gasification are to be conducted. Each will demand extensive water supplies and will contribute to drawing down the water table, thereby affecting the water available for agriculture, grazing, and even human drinking supplies. Each will contribute to population growth, leading to large demands for community services. Not by energy alone does man live.

While we pride ourselves in our perceptions of truth in our areas of specialty, we must widen them to include a holistic perspective. Otherwise, what is really important is not always obvious.

It seems to me, for example, that it would be of great help to the President if he combined the Council of Economic Advisors, the Council on Environmental Quality, and the Office of Science and Technology Policy into a Council of Holistic Advisors.

Another obstacle to progress is that we are flying blindly. We have no means of measuring growth in quality of life. We have become enamored with the concept of gross national product — the GNP — and have made a religion out of it. . . .failing to recognize how inaccurate it is for measuring and motivating the movement of human beings toward a higher quality of life.

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For obtaining information about scientific and technical activities abroad, a useful but often neglected source are the science and technology attaches and counselors assigned to US embassies and missions. Though they won't thank SGR for offering this advice to its readers, the fact is that these officials, generally well-informed about R&D-related affairs in their territory, will usually respond to requests for publications, contacts, general information, and so forth. Unless otherwise indicated, the address in each case is US Embassy, capital and country. The title for each is Science and Technology Attache, unless marked by *, which signifies the rank of Counselor.

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